ЕВРАЗИЙСКИЙ СОВЕТ ПО СТАНДАРТИЗАЦИИ, МЕТРОЛОГИИ И СЕРТИФИКАЦИИ (EACC)

EURO-ASIAN CONCIL FOR STANDARTIZATION, METROLOGY AND CERTIFICATION (EASC)

INTERSTATE STANDARD

GOST 31937–2011

BUILDINGS AND CONSTRUCTIONS

Technical Condition Examination and Monitoring Rules

Official edition

Registered with

No. 7089

On 4 December, 2012

INTERSTATE SCIENTIFIC AND ENGINEERING COMMISSION ON STANDARTIZATION, TECHNICAL RATE SETTING AND COMPLIANCE EVALUATION IN CONSTRUCTION FIELD

Foreword

Purposes, basic principles and main procedure for interstate standardization in the construction field have been established in GOST 1.0-92 *Interstate standardization system. Main provisions* and GOST1.2-2009 *Interstate standardization system. Interstate standards. Rules and recommendations on the interstate standardization. Procedure for the development, acceptance, renewal and cancellation.*

Standard information

1 DEVELOPED BY the State Unitary Enterprise of Moscow – Moscow Scientific Research and Design Institute of Typology, Experimental Design with the participation of the State Unitary Enterprise of Moscow – Scientific Research Institute of Construction in Moscow (*NIIMosstroy*), Scientific Production Association SODIS, JSC Research Center *Stroitel'stvo* – Scientific Research, Design and Construction and Technological Institute of Concrete, Reinforced Concrete named after A.A. Gvozdev, JSC Research Center *Stroitel'stvo* – Scientific and Research, Design and Exploration and Construction and Technological Institute of Foundations and Underground Structures named after N.M. Gersevanov, JSC Research Center – The Central Scientific and Research Institute of Building Structures named after V.A. Kucherenko, JSC TsNIIPromzdany, JSC with 100% state capital Design and Technological Bureau for Concrete and Reinforced Concrete, Federal State Budget Scientific Institution – Institute of Integrated Development of Russian Academy of Science, Independent Noncommercial organization – World Academy of Integrated Protection Sciences.

2 RECORDED BY the Technical Committee on the standardization TC 465 *Stroitel'stvo*.

3 ACCEPTED BY the Interstate Scientific and Technical Commission on the standardization, technical rate setting and certification in the constriction field (Protocol No. 39 dated 8 December, 2011)

The standard was accepted by voting:

Short name of the country as per Interstate classifier(ISO 3166) 004 - 97	Country code as per Interstate classifier (ISO 3166) 004 - 97	Brief name of State construction control authority
Azerbaidjan	AZ	Construction Committee (Gosstroy)
Armenia	AM	Ministry of City Planning
Kazakstan	KZ	Agency for Construction Issues and Housing and Utilities Infrastructure
Kirgizia	KG	Construction Committee (Gosstroy)
Moldova	MD	Ministry of Construction and Regional Development Министерство
RF	RU	Ministry of Regional Development

Short name of the country as per Interstate classifier(ISO 3166) 004 - 97	Country code as per Interstate classifier (ISO 3166) 004 - 97	Brief name of State construction control authority
Tadjikistan	TJ	Agency for Construction and Architecture
Uzbekistan	UZ	Gosarhitektstroy
Ukraine	UA	Ministry of Regional Development, Construction and Housing and Utilities Infrastructure

4 PUT IN FORCE FOR THE FIRST TIME

Information as to the putting into force (termination) of this standard and amendments to it within the territory of the above-stated countries is published in indexes of national (state) standards issued in these countries.

Information as to amendments to this standard is published in the index (catalogue) *Interstate standards* and amendment wording is provided in information indexes *Interstate standards.* In the event of revision or cancellation of this standard the appropriate information will be published in information index *Interstate standard*.

Contents

I N T E R S T A T E S T A N D A R D

BUILDINGS AND CONSTRUCTIONS
Rules for examination and monitoring of technical condition

Buildings and constructions.

Technical condition examination and monitoring rules

Put in force date —

1 Scope of application

This standard is a regulatory basis for the control of mechanical safety degree and realization of design works aimed to increase a degree of mechanical safety of buildings and constructions. This standard regulates requirements for activities and their scope to obtain information necessary for the control and increase of mechanical safety degree of buildings and constructions.

This standard covers activities related to:

- integrated examination of technical condition of buildings or constructions for the design of their reconstruction or capital repair,
- examination of technical condition of buildings and constructions to evaluate the possibility of their subsequent failure-free operation or necessity for their reconstruction and reinforcement of structures;
- general monitoring of technical condition of buildings and constructions to detect objects whose structures changed their stress and strain state and requires the examination of their technical condition,
- monitoring of technical condition of buildings and constructions being in zones affected by building sites and natural and technogenic impacts to provide a safety operation of these buildings and constructions,
- monitoring of technical condition of buildings and constructions which are in restrictedly serviceable or failure condition for the evaluation of their current technical condition and realization of activities to rectify failure condition.

Official edition

- monitoring of technical condition of unique including high-rise and large span buildings and constructions for the control of load-carrying structures and prevention of catastrophes connected with their failure.

This standard does not establish requirements for the development of activities on the rectification of defects detected in soil bodies, structures, elements and their connections as well as for the development of activities on the renovation, reinforcement and capital repair of the object.

The requirements of this standard do not cover other types of examination and monitoring of technical condition as well as transport, hydraulic engineering and reclamation constructions, main pipelines, underground constructions and objects on which mining and underground works are carried out as well as works connected with forensic construction examination.

1 Terms and definitions

This standard applies the following terms with appropriate definitions:

3.1 **buildings (constructions) operating safety:** integrated property of the object to withstand its change to failure condition defined by: design solution and degree of its real implementation during building; current residual life and technical condition of the object (ageing of material, rebuilding, alteration, extension, reconstruction, capital repair etc.) and environment both natural and technogenic nature, combination of anti terror activities and a degree of their realization, requirements to the operation and degree of their real implementation.

3.2 **mechanical safety of buildings (constructions):** condition of building structures and foundation of building or construction in the absence of unallowable risk connected with damage to life or health of citizens, property of individuals or legal entities, state or municipal property, environment, life and health of animals and plants due to the failure or instability of building, construction or their portion.

3.3 **integrated examination of buildings (constructions) technical condition:** set of activities aimed at the determination and evaluation of actual values of parameters monitored and related to foundation soil, building structures, engineering support (equipment, pipelines, electric mains etc.) characterizing a serviceability of object examined and defining a possibility for its subsequent operation, reconstruction or necessity for renovation, reinforcement, repair and included examination of technical building (construction) condition, heat engineering and acoustic structural properties, object engineering support systems except for production equipment.

3.4 **examination of buildings (constructions) technical condition:** a set of activities aimed at the determination and evaluation of actual parameters characterizing a serviceability of object examined and defining a possibility for its subsequent operation, reconstruction or necessity for renovation, reinforcement, repair and included examination of foundation soil and building structures with

respect to the detection of change in soil properties, deformation damages, defects of load-carrying structures and determination of their actual load-carrying capacity.

3.5 **specialized organization:** an individual or legal entity authorized by the law for performance of activities aimed at the examination and monitoring of buildings and constructions.

3.6 **technical condition category:** degree of serviceability of load-carrying building structure or building and construction in general as well as soil of their foundation established depending on the part of decrease in their loading capacity and operating characteristics.

3.7 **technical condition evaluation criteria:** quantitative or qualitative parameter value established by the project or regulatory document and characterizing deformability, load-carrying capacity and other rated characteristics of building structures and foundation soil.

3.8 **technical condition evaluation:** Establishment of damage rate and technical condition category of building structures or buildings in general including foundation soil condition on the basis of comparison of actual values of signs estimated in terms of quality with values of the same signs established by the project or regulatory document.

3.9 **check calculation:** design of existing structure and (or) foundation soil Расчет существующей конструкции и (или) грунтов основания по in accordance with effective design standards with the introduction of the following obtained as a result of examination or under design and as-built documentation into the design: geometrical design parameters, actual strength of building materials and foundation soil, acting loads, specified design scheme with respect to existing defects and damages.

3.10 **regulatory technical condition:** category of technical condition at which quantitative and qualitative values of parameters of all criteria used to evaluate technical condition of engineering structures of buildings and constructions including foundation soil condition meet values established in the design documentation with respect to variation limits.

3.11 **serviceable technical condition:** category of technical condition at which some among estimated monitored parameters do not meet project requirements or standards but existing violations of requirements in specific operating conditions do not lead to the violation of serviceability and necessary load-carrying capacity of structures and foundation soil with respect to the influence of existing defects and damages is ensured.

3.12 **restrictedly serviceable technical condition:** category of technical condition of engineering structure or building in general including foundation soil condition which shows inclinations, defects and damages that resulted in the reduction of load-carrying capacity but hazard of simultaneous failure, instability or stalling is not present, and functioning of structures and operation of building or construction is possible either at the checking (monitoring) of technical condition or during the realization of necessary activities related to renovation or

reinforcement of structures and (or) foundation soils and at the subsequent monitoring of technical condition (if necessary).

3.13 **failure condition:** category of technical condition of engineering structure or building and construction in general including condition of foundation soil characterized by damages and deformations proving exhaust of load-carrying capacity and hazard of building failure and (or) characterized by inclinations that can cause the instability of the object.

3.14 **general monitoring of buildings (constructions) technical condition:** monitoring and control system carried out in accordance with the specific program confirmed by the Customer for the detection of objects where significant changes in stress and strain state of load-carrying structures or inclination took place and which require examination of technical condition (changes of stress and strain state are characterized by change of existing and occurrence of new deformations or defined by instrumental measurements).

3.15 **monitoring of technical condition of buildings (constructions) being in the zone affected by building site and natural and technogenic impacts::** monitoring and control system carried out in accordance with the specific program on objects falling into the zone affected by building site and natural and technogenic impacts to monitor their technical condition and to timely take measures aimed at the rectification of arising negative factors leading to deterioration of this condition.

3.16 **monitoring of technical condition of buildings (constructions) being in restrictedly serviceable or failure condition:** monitoring and control system carried out in accordance with the specific program to trace a degree and rate of change in technical condition of the object and take, if it is necessary, emergency measures to prevent its failure or stalling, acting until the object is brought to serviceable technical condition.

3.17 **monitoring of technical condition of unique buildings (constructions):** monitoring and control system carried out in accordance with specific program to ensure a safe functioning of unique buildings or constructions due to timely detection at the early stage of negative change in stress and strain state of structures and foundation soils or inclination that can result in the change of objects to restrictedly serviceable or failure condition.

3.18 **unique building (construction):** capital construction object, its design documentation stipulates even one of the following characteristics: height of more than 100 m, aisles of more than 100 m, presence of console of more than 20 m, penetration of underground part (completely or partially) below the grade mark for more than 15 m, with interval of more than 50 m or with construction volume of more than 100,000 m^3 and with simultaneous presence of 500 people.

3.19 **current technical condition of buildings (constructions):** technical condition of buildings and constructions as of the date of their examination or monitoring stage being conducted.

3.20 **dynamic parameters of buildings (constructions):** parameters of buildings and constructions characterizing their dynamic properties appearing during dynamic loading and including periods and decrements of their own oscillations of essential tone and overtones, transfer function of objects, their parts and elements etc.

3.21 **current dynamic parameters of buildings (constructions) текущие динамические параметры зданий (сооружений):** dynamic parameters of buildings and constructions at the moment of their examination or monitoring stage being conducted.

3.22 **renovation:** set of activities aimed to bring operating properties of structures that fell into restrictedly serviceable state to the level of their initial condition defined by existing requirements of regulatory documents at the moment of the object design.

3.23 **reinforcement:** set of activities ensuring an increase of load-carrying capacity and operating properties of engineering structure or building and construction in general including foundation soils as compared with actual condition or design characteristics.

3.24 **building obsolescence:** gradual (through time) deviation of main operating characteristics from the state-of-the-art level of technical requirements to the operation of buildings and constructions.

3.25 **building dilapidation:** deterioration of technical and operating characteristics of building connected with it because of objective causes.

3.26 **load-carrying structures technical condition monitoring system:** combination of technical and software tools that allows collecting and processing information on different parameters of engineering structures (geodesic, dynamic, deformational etc.) for the purpose of building and construction technical condition evaluation.

3.27 **engineering support monitoring system:** combination of technical and software tools that allows collecting and processing information on different parameters of engineering support of building (construction) in order to control the occurrence of destabilized factors and transfer messages about their occurrence or prediction of emergency situations to the single operational-dispatching office system of the city.

6.5 Monitoring of unique buildings and constructions technical condition

6.5.1 Monitoring of unique buildings (constructions) engineering structures and foundations technical condition is carried out to ensure their safe functioning, its results are a basis for operating activities on these objects. The monitoring includes control of processes developing in the structures of objects and soil to timely detect at the early stage a tendency of a negative change in the stress and strain state of structures and foundations which can cause a change of the object to restrictedly serviceable or failure condition as well as receipt of necessary data for

the development of activities on rectification of resultant negative processes.

6.5.2 Scope of activities on the monitoring of unique buildings (constructions) foundations and engineering structures technical condition is subject to individual programs on measurements and analysis of load-carrying structures technical condition depending on the engineering solution of building (construction) and its deformation condition.

6.5.3 In the operated unique building (construction) as a rule an access to most load-carrying structures is significantly limited and activities on the traditional examination of structures technical condition are time-taking and expensive. Such objects require using special methods and technical aids for early detection and localization of places where stress and strain state of structures changes with subsequent examination of technical condition of detected hazard parts of structures.

6.5.4 The computer-based stationary technical condition monitoring system (station) (in accordance with early developed project) is installed to carry out control and early diagnostic of technical condition of foundations and engineering structures of unique building (construction). The system shall ensure in automatic mode the detection of change in stress and strain state of structures with localization of their hazard part, determination of building or construction inclination level, and if it is necessary, other parameters (deformation, pressure etc.).

The computer-based stationary monitoring system (station) adjustment is carried out, as a rule, using early developed mathematical model to make integrated engineering analyses aimed at the evaluation of occurrence and development of defects in engineering structures including in crisis situations.

6.5.5 The computer-based stationary technical condition monitoring system (station) for foundations and engineering structures shall:

- perform an integrated processing of carried out measurement results,
- carry out an analysis of different measured parameters of engineering structures (dynamic, deformation, geodesic etc.) and comparison with their limit allowable values,
- ensure sufficient information to detect at the early stage a tendency of negative change in stress and strain state of structures that can result in restrictedly serviceable or failure condition.

6.5.6 When detecting places where stress and strain state of structures changes, these parts shall be examined using methods stated in Section 5 and the results of the examination allow making conclusions on the technical state of structures, causes of change in their stress and strain state and necessity to take measures on renovation or reinforcement of structures.

6.5.7 Based on the results of monitoring of unique building (construction) foundations and engineering structures the decision is issued and its form shall be developed based on the results of design of computer-based stationary technical condition monitoring system (station) for foundations and engineering structures

6.5.8 The monitoring of unique building (construction) engineering support

system is carried out in order to ensure its safe functioning. The monitoring results are a basis of activities aimed to ensure a safe operation of these objects. At the monitoring the control of serviceability and engineering support system operating results is carried out to timely detect, at the early stage, negative factors threatening safety of unique buildings (constructions).

6.5.9 The engineering support monitoring system (in accordance with early developed project) is installed to carry out control and early diagnostic of technical condition of engineering support of a specific unique building (construction).

6.5.10 At the monitoring of unique building (construction) technical condition according to the decision of local authorities, bodies authorized to conduct a state construction supervision or owner of the object, the general safety of these objects is monitored (with integrated risk evaluation) in the event if emergency impacts of natural and technogenic type occur.

6.5.11 Requirements to the monitoring of general object safety (with integrated risk evaluation) in the event if emergency impacts of natural and technogenic type occur are presented in Appendix R.

6.5 Monitoring of unique buildings and constructions technical condition

6.5.1 Monitoring of unique buildings (constructions) engineering structures and foundations technical condition is carried out to ensure their safe functioning, its results are a basis for operating activities on these objects. The monitoring includes control of processes developing in the structures of objects and soil to timely detect at the early stage a tendency of a negative change in the stress and strain state of structures and foundations which can cause a change of the object to restrictedly serviceable or failure condition as well as receipt of necessary data for the development of activities on rectification of resultant negative processes.

6.5.2 Scope of activities on the monitoring of unique buildings (constructions) foundations and engineering structures technical condition is subject to individual programs on measurements and analysis of load-carrying structures technical condition depending on the engineering solution of building (construction) and its deformation condition.

6.5.3 In the operated unique building (construction) as a rule an access to most load-carrying structures is significantly limited and activities on the traditional examination of structures technical condition are time-taking and expensive. Such objects require using special methods and technical aids for early detection and localization of places where stress and strain state of structures changes with subsequent examination of technical condition of detected hazard parts of structures.

6.5.4 The computer-based stationary technical condition monitoring system (station) (in accordance with early developed project) is installed to carry out control and early diagnostic of technical condition of foundations and engineering structures of unique building (construction). The system shall ensure in automatic mode the detection of change in stress and strain state of structures with localization of their hazard part, determination of building or construction inclination level, and if it is necessary, other parameters (deformation, pressure etc.).

The computer-based stationary monitoring system (station) adjustment is carried out, as a rule, using early developed mathematical model to make integrated engineering analyses aimed at the evaluation of occurrence and development of defects in engineering structures including in crisis situations.

6.5.5 The computer-based stationary technical condition monitoring system (station) for foundations and engineering structures shall:

- perform an integrated processing of carried out measurement results,
- carry out an analysis of different measured parameters of engineering structures (dynamic, deformation, geodesic etc.) and comparison with their limit allowable values,
- ensure sufficient information to detect at the early stage a tendency of negative change in stress and strain state of structures that can result in restrictedly serviceable or failure condition.

6.5.6 When detecting places where stress and strain state of structures

changes, these parts shall be examined using methods stated in Section 5 and the results of the examination allow making conclusions on the technical state of structures, causes of change in their stress and strain state and necessity to take measures on renovation or reinforcement of structures.

6.5.7 Based on the results of monitoring of unique building (construction) foundations and engineering structures the decision is issued and its form shall be developed based on the results of design of computer-based stationary technical condition monitoring system (station) for foundations and engineering structures

6.5.8 The monitoring of unique building (construction) engineering support system is carried out in order to ensure its safe functioning. The monitoring results are a basis of activities aimed to ensure a safe operation of these objects. At the monitoring the control of serviceability and engineering support system operating results is carried out to timely detect, at the early stage, negative factors threatening safety of unique buildings (constructions).

6.5.9 The engineering support monitoring system (in accordance with early developed project) is installed to carry out control and early diagnostic of technical condition of engineering support of a specific unique building (construction).

6.5.10 At the monitoring of unique building (construction) technical condition according to the decision of local authorities, bodies authorized to conduct a state construction supervision or owner of the object, the general safety of these objects is monitored (with integrated risk evaluation) in the event if emergency impacts of natural and technogenic type occur.

6.5.11 Requirements to the monitoring of general object safety (with integrated risk evaluation) in the event if emergency impacts of natural and technogenic type take place are presented in Appendix R.